Task 17: DataComm Literature Review (Prinzo)

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Requirements Statement
Operational Shortfall or Knowledge Gap Renewed interest in digital ATC communications has revealed that research findings since 1994 are scattered and the results of some early field studies (e.g., Miami Trials) permanently lost. The state of knowledge is fragmented and will be of limited value in developing the requirements for datacom program planning.
Benefit in Closing the Shortfall or Gap A summary and review of the research in ATC communications is needed to consolidate independent findings related to the language issues, communication problems and procedural differences ATP certificated pilots encounter when flying domestically and internationally that may be applied to digital voice communications systems and their applications. It is important to know which messages may present problems for all pilots, especially those who speak English as a foreign language.
Description of the Desired Product A report summarizing scientific research reports over the last 20 years pertaining to radio telephony and digital voice communications with a list of recommendations.
Schedule Provide the sponsor with a power point briefing of the findings.

Research Objective
Conduct a literature review of current research in pilot controller communications with a focus of updating the information presented in *Human Factors in ATC/Flight Deck Integration: Implications of Data Link Simulation Research* (Kerns, 1994).

Background
ATC- flight crew communication is a critical component of the NAS and accurate communications is vital to ensure safe and efficient flight operations. Effective communications minimize pilot workload enhance situation awareness and reduce the potential for human error. Development of standardized pilot-controller phraseology in current communications systems is intended to help ensure accurate and efficient communications. DataCom, a data link application for air-ground air- traffic-control (ATC) communicated messages is being reconsidered to augment current pilot controller radiotelephony. In datacomm operations, development of standard message sets fulfills the same purpose.

The data communications program office identified a number of potential hazards related to loss of data communications information, misleading information, and human error. Risks include incomplete, corrupted, misleading, missing, or misunderstood messages between controllers and flight crews. Part of the risk is that the

implementation of the RTCA SC-214 / EUROCAE WG78 internationally derived message set may not exactly reflect the meaning, context, or intent of domestic voice phraseology, leading to increased likelihood for communication breakdown. There is also concern that international users may not readily comprehend written English as it appears in data communications, leading to missed or misunderstood messages. Of particular concern are conditional and concatenated instructions. Recent reports from ICAO identified more frequent aircrew misinterpretation of clearances that included the message elements AT, BY, and EXPECT.

Thus, the purpose of the present activity is to conduct a literature review of current research in pilot controller communications with a focus of updating the information presented in *Human Factors in ATC/Flight Deck Integration: Implications of Data Link Simulation Research* (Kerns, 1994). Since the issuance of that report, simulation and operational research activities have been published in the open literature and in government and business publications. Much new information may be available, but it is fragmented. Therefore, this research activity will limit itself to ATC messages transmitted by controllers and pilots over a voice radiotelephony communication system and controller pilot data link communication system (CPDLC), as well as simulation and modeling studies, operational data analysis reports, and findings from interviews with pilots, controllers, or both. Research findings over the last 15 years will be searched that involves pilot and controller communications in all areas of operation (e.g., in the air, on the ground) and for all phases of flight (e.g., taxi out, climb, cruise, descend, landing, taxi in).

Previous Activity on this Task

None

Proposed or Planned Research

A literature search will be conducted to obtain publications that will be organized and summarized into the following themes:

1. Workload
2. Performance
3. Attention
4. Communication Efficiency
5. Communication Problems
6. Party Line Information
7. Situational Awareness
8. Modes of Presentation
9. Limitations

Research Question(s)

What are the lessons learned from pilot controller radiotelephony and CPDLC that can benefit Datacomm operations?

Technical Approach

Current Year

A key-word search will be the primary approach to finding relevant materials using the following words, phrases, and acronyms (individually and chained together):

1. Data link messages,
2. CPDLC messages,
3. CPDLC Literature Review,
4. Data link messages literature review,
5. SC-214 message set,

6. Data link communications,
7. Air traffic data communication service
8. CPDLC human factors
9. FANS messages.

Out-Years

Complete OAM Technical report.

Air Traffic Resources Required

None

Information Technology Resources Required

Xyant Support

Calibration

None

FY10 Milestone Schedule		
Description	Proposed Start Date	Proposed Completion Date
Survey the literature for flight deck and controller data link	FY10 Q1	FY10 Q2
Compile a list of relevant documentation for review	FY10 Q1	FY10 Q2
Categorize the list with respect to relevance	FY10 Q2	FY10 Q2
Read and summarize the documents into themes	FY10 Q2	FY10 Q4
Compile a list of operational recommendations	FY10 Q4	FY10 Q4

FY10 Deliverables		
Description	Proposed completion date	Actual completion date
Compile a list of operational recommendations	FY10 Q4	FY10 Q4